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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/815,958	03/23/2001	Alvin D. Compaan	1-22335	6483

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MACMILLAN SOBANSKI & TODD, LLC
ONE MARITIME PLAZA FOURTH FLOOR
720 WATER STREET
TOLEDO, OH 43604-1619

EXAMINER

LE, DUNG ANH

ART UNIT

PAPER NUMBER

2818

DATE MAILED: 06/20/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/815,958

Applicant(s)

COMPAAN ET AL.

Examiner

DUNG A LE

Art Unit

2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 April 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 and 29-43 is/are pending in the application.
- 4a) Of the above claim(s) 13-28 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 and 29-43 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 March 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

This Office Action is in response to Amendment filed on 4/2/2003.

Claims 13-28 have been cancelled.

Claim 1 has been amended.

Claims 29-43 are newly added.

Claims 1-12 and 29-43 are pending in the present application at the time of examination

Claim Rejections

Set of claims 1- 6 , 40 and 42

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1- 4 are rejected under 35 USC 102 (b) as being anticipated by Shaw et al. (4,064,522).

Shaw et al. disclose a method of making a semiconductor 5 comprising depositing a group II-group VI compound (Cadmium Selenide, in column 2, line 21) onto a substrate 1 in the presence of nitrogen (col 4, lines 50- 56) using sputtering to produce a nitrogen-doped semiconductor (It is inherent N-type (N, P As...) doping includes Nitrogen, it is not a negative type doping).

Regarding claim 2, the nitrogen is in a gaseous form during the sputtering (col 4, lines 50- 56).

Regarding claim 3, the group II-group VI compound is one or more compounds of the group zinc telluride, zinc selenide, zinc sulfide, mercury selenide, mercury telluride, mercury sulfide, cadmium sulfide, cadmium telluride, cadmium selenide, magnesium telluride, and magnesium selenide (Cadmium Selenide is cited in present reference, in column 2, line 21).

Regarding claim 4, the sputtering is RF sputtering (col 4, lines 54-55).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention

was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5- 6 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Shaw et al. as applied to claim 1 above and in view of Compaan (5,393,675 in record/IDS) .

Shaw et al. disclose the sputtering is RF sputtering (col 4, lines 54-55) except for the sputtering is reactive sputtering.

However, Compaan shows that the RF (magnetron) sputtering system 30 in utilizes a 13.56 Mhz generator and power monitor 36 with a network impedance matching system (Figure. 3, col 6, lines 10-15) and an atmosphere of gas having ions (col 6, lines 42-44).

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to employ the sputtering is reactive sputtering to form the semiconductor layer, as taught by Compaan, in order to form the semiconductor layer having the thickness as thin as possible to minimize the amount of light absorbed in the top layer and also having the doping level to minimize ohmic losses.

Regarding claim 6, Shaw et al. disclose the claimed invention except for the sputtering step creates a layer of the doped group II-group VI compound that is larger than about 4 cm².

However, Compaan teaches for larger substrate (more than two inch diameter substrate, the power rating of the generator should be scaled approximately in proportion to the area (col 6, lines 15-19) in the process of depositing of the semiconductor layer.

Accordingly, given the cumulative teaching of Compaan, it would have been obvious to one of ordinary skill in the art of making semiconductor devices to determine the workable or optimal ranges for a layer of the doped group II-group VI compound that is larger than about 4 cm^2 through routine experimentation and optimization to obtain optimal device performance.

Claims 40 and 42 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Shaw et al. as applied to claim 1 above and in view of the following remark.

Shaw et al. do not teach the group II-group VI compound is zinc telluride and the nitrogen-doped semiconductor is a p-type layer.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the group II-group VI compound is zinc telluride and the nitrogen-doped semiconductor is a p-type layer form the nitrogen-doped semiconductor, which are commonly used to obtain the best resultant semiconductor, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

Set of claims 7- 11, 41 and 43.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 7- 9 are rejected under 35 USC 102 (b) as being anticipated by Shaw et al. (4064522).

Shaw et al. disclose a method of making a photovoltaic cell (col 2, line 14) comprising using sputtering to apply a back contact layer 5 of group II-group VI compound (Cadmium Selenide, in column 2, line 21) to a substrate 10 in the presence of nitrogen, the back coating layer being doped with nitrogen (col 4, lines 50-56) (It is inherent N-type (N, P As...) doping includes Nitrogen, it is not a negative type doping).

Regarding claim 8, the nitrogen is in a gaseous form during the sputtering (col 4, lines 50- 56).

Regarding claim 9, the group II-group VI compound is one or more compounds of the group zinc telluride, zinc selenide, zinc sulfide, mercury selenide, mercury telluride, mercury sulfide, cadmium sulfide, cadmium telluride, cadmium selenide,

magnesium telluride, and magnesium selenide (Cadmium Selenide is cited in present reference, in column 2, line 21).

Regarding claim 10, the sputtering is RF sputtering (col 4, lines 54-55).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 10- 11 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Shaw et al. as applied to claim 1 above and in view of Compaan (5393675 in record/IDS.).

Shaw et al. disclose the sputtering is RF sputtering (col 4, lines 54-55) except for the sputtering is reactive sputtering.

However, Compaan shows that the RF magnetron sputtering system 30 in utilizes a 13.56 Mhz generator and power monitor 36 with a network impedance matching system (col 6, lines 10-15) and an atmosphere of gas having ions (col 6, lines 42-44).

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to employ the sputtering is reactive sputtering to form the back coating contact layer, as taught by Compaan, in order to form the back coating

contact layer having the thickness as thin as possible to minimize the amount of light absorbed in the top layer and also having the doping level to minimize ohmic losses.

Regarding claim 11, Shaw et al. disclose the claimed invention except for the sputtering step creates a layer of the doped group II-group VI compound that is larger than about 4 cm².

However, Compaan teaches for larger substrate (more than two inch diameter substrate, the power rating of the generator should be scaled approximately in proportion to the area (col 6, lines 15-19, Figure 3) in the process of depositing of the semiconductor layer.

Claims 41 and 43 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Shaw et al. as applied to claim 7 above and in view of the following remark.

Shaw et al. do not teach the group II-group VI compound is zinc telluride and the nitrogen-doped semiconductor is a p-type layer.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the group II-group VI compound is zinc telluride and the nitrogen-doped semiconductor is a p-type layer form the nitrogen-doped semiconductor, which are commonly used to obtain the best resultant semiconductor, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

Set of claims 29- 33

Claims 29- 33 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Shaw et al. in view of Niwa (55778501) and further in view of the following remark.

Shaw et al. show a method of making a semiconductor comprising depositing a group II-group VI compound (Cadmium Selenide, col 2, line 21) onto a substrate 10 using sputtering to produce a nitrogen-doped semiconductor (col 4, lines 50-56) (It is inherent N-type (N, P As...) doping includes Nitrogen, it is not a negative type doping) , wherein the sputtering is carried out in an atmosphere containing an amount of nitrogen.

Shaw et al. do not show that wherein the sputtering is carried out in an atmosphere containing an amount of nitrogen within the range of from about 0.5 percent to about 3 percent.

Niwa teaches the step of the sputtering is carried out in an atmosphere containing an amount of nitrogen within the range at the range of 5% or less (col 10, lines 30- 35).

It would have been obvious to one having ordinary skill in the art at the time of the invention was made to the step of the sputtering is carried out in an atmosphere containing an amount of nitrogen within the range of from about 0.5 percent to about 3 percent, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art.

Regarding claim 30, the remainder of the atmosphere is argon gas (col 12, line 55, Niwa).

Regarding claim 31, Shaw teaches the group II-group VI compound is one or more compounds of the group zinc telluride, zinc selenide, zinc sulfide, mercury selenide, mercury telluride, mercury sulfide, cadmium sulfide, cadmium telluride, cadmium selenide, magnesium telluride, and magnesium selenide (Cadmium Selenide is cited in present reference, in column 2, line 21).

Claims 32 and 33 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Shaw et al. as applied to claim 29 above and in view of the following remark.

Shaw et al. and Niwa do not teach the group II-group VI compound is zinc telluride and the nitrogen-doped semiconductor is a p-type layer.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the group II-group VI compound is zinc telluride and the nitrogen-doped semiconductor is a p-type layer form the nitrogen-doped semiconductor, which are commonly used to obtain the best resultant semiconductor, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

Set of claims 34- 38.

Claims 34-43 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Shaw et al. in view of Niwa (55778501) and further in view of the following remark.

Shaw et al. teach a method of making a photovoltaic cell comprising using sputtering to apply a back contact layer of group II-group VI compound (Cadmium Selenide, col 2, line 21) to a substrate 10 in the presence of nitrogen, the back coating layer being doped with nitrogen ((col 4, lines 50-60), It is inherent N-type (N, P As...) doping includes Nitrogen, it is not a negative type doping), wherein the sputtering is carried out in an atmosphere containing an amount of nitrogen.

Shaw et al. do not show that wherein the sputtering is carried out in an atmosphere containing an amount of nitrogen within the range of from about 0.5 percent to about 3 percent.

Niwa teaches the step of the sputtering is carried out in an atmosphere containing an amount of nitrogen within the range at the range of 5% or less (col 10, lines 30- 35).

It would have been obvious to one having ordinary skill in the art at the time of the invention was made to the step of the sputtering is carried out in an atmosphere containing an amount of nitrogen within the range of from about 0.5 percent to about 3 percent, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art.

Regarding claim 35, the remainder of the atmosphere is argon gas (col 12, line 55, Niwa).

Regarding claim 36, Shaw show the group II-group VI compound is one or more compounds of the group zinc telluride, zinc selenide, zinc sulfide, mercury selenide, mercury telluride, mercury sulfide, cadmium sulfide, cadmium telluride, cadmium selenide, magnesium telluride, and magnesium selenide (Cadmium Selenide is cited in present reference, in column 2, line 21).

Claims 37- 38 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Shaw et al. as applied to claim 34 above and in view of the following remark.

Shaw et al. do not teach the group II-group VI compound is zinc telluride and the nitrogen-doped semiconductor is a p-type layer.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the group II-group VI compound is zinc telluride and the nitrogen-doped semiconductor is a p-type layer form the nitrogen-doped semiconductor, which are commonly used to obtain the best resultant semiconductor, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

Claim 39 is rejected under 35 U.S.C. 103 (a) as being unpatentable over Shaw et al. and Niwa as applied to claim 34 above and in view of Compaan (5,393,675 in record/IDS) .

Shaw et al. disclose the sputtering is RF sputtering (col 4, lines 54-55) except for the sputtering is reactive sputtering.

However, Compaan shows that the RF (magnetron) sputtering system 30 in utilizes a 13.56 Mhz generator and power monitor 36 with a network impedance matching system (Figure. 3, col 6, lines 10-15) and an atmosphere of gas having ions (col 6, lines 42-44).

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to employ the sputtering is reactive sputtering to form the semiconductor layer, as taught by Compaan, in order to form the semiconductor layer having the thickness as thin as possible to minimize the amount of light absorbed in the top layer and also having the doping level to minimize ohmic losses.

When responding to the office action, Applicants' are advice to provide the examiner with the line numbers and page numbers in the application and/or references cited to assist the examiner to locate the appropriate paragraphs.

A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) day from the day of this letter. Failure to respond within the period for response will cause the application to become abandoned (see M.P.E.P 710.02(b)).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dung A. Le whose telephone number is 703-306-5797. The examiner can normally be reached on Monday-Friday 8:00am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on 703-308-4910. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Dung A. Le

Examiner

